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MOUNTAIN PINE BEETLE CONDITIONS
CRYSTAL BAY AREA
LAKE TAHOE, NEVADA

APPRAISAL SURVEY
November, 1957

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INTRODUCTION

An infestation of mountain pine beetle (Dendroctonus monticolae Hopk.) has been active for a few years in a relatively small basin of timber in the Crystal Bay area at the north end of Lake Tahoe in the State of Nevada. The basin, approximately 4,000 acres in size, is timbered with predominately second-growth ponderosa pine and Jeffery pine with some white fir, sugar pine, and incense cedar. Most of the area is owned by one man; however the land between State Highway 28 and the lakeshore is subdivided into several ownerships. A road right-of-way through the infested area above the highway was recently purchased by the State of Nevada.

The Crystal Bay infestation in ponderosa pine was first reported by the Supervisor of the Toiyabe National Forest in August of 1950[1/]. The epidemic probably started in 1949. Since the outbreak was first reported it has been kept under continued surveillance by the entomologists of the California Forest and Range Experiment Station through an informal agreement with the Intermountain Station. In April 1957 an appraisal of the infestation was made by R. C. Hall and B. E. Wickman, California Forest and Range Experiment Station and R. I. Washburn, Intermountain Station. A rough estimate, based primarily on observations, indicated one infested tree per acre. Projecting this figure into the total number of acres was the basis of an estimate of 4,000 infested trees[2/].

1/ R. C. Hall, Forest Insect Conditions, Toiyabe National Forest--Crystal Bay Area, May 1953, Reconnaissance Survey, Forest Insect Laboratory, Berkeley, California.

2/ R. I. Washburn, R. C. Hall, B. E. Wickman, Appraisal Survey, Crystal Bay Area, Lake Tahoe, Nevada, April 1957.

FALL SURVEY

At the request of the State Forester of Nevada, an appraisal survey was conducted by a four-man crew the week of November 12, 1957. A systematic 10 percent line plot cruise was used to cover the infested area. A 1/5-acre circular plot was taken every two chains along parallel lines run in the cardinal direction most nearly at right angles to the major contours. The lines were spaced 10 chains apart and tied into section lines. Infested trees and "red tops" (trees attacked in 1956) appearing on all plots were recorded by DBH. In addition, on every tenth plot (making a 1 percent cruise) trees killed prior to 1956 and all green ponderosa pine, Jeffery pine, sugar pine, white fir and incense cedar over 6" DBH were recorded.

Results

The survey shows that the epidemic covers approximately 1,650 acres. Within this area there are 2,460±524 ponderosa pine that now contain bark beetle broods (table 1). Most of the infested trees contain a predominance of mountain pine beetle, however in a few cases western pine beetle (Dendroctonus brevicomis Lec.) predominates.

The number of infested trees average nearly 1.5 per acre and the "red tops" 1.6 per acre, totaling 2,650±474. These figures convert to a buildup ratio of a little less than 1 to 1 (.92-1). The median DBH of the infested trees is 11.6±.09 and the "red tops" 10.6±.08, which indicates that even though there is a small increase in the diameter of the infested trees over last year, the total bole surface infested is probably nearly the same since there was a slight decrease in the number of trees infested. No detectable difference between the infested trees and the "red tops" in either the height of attack or concentration of attack was noted.

The remaining green timber within the infested area averages 77 stems per acre of which 41.3 percent is ponderosa pine, 23.4 percent Jeffery pine, 1.1 percent sugar pine, 32.2 percent white fir, and 2 percent incense cedar (table 2). The average size of the green ponderosa pine is 12.3±.02 inches. Approximately 13 percent of the original ponderosa pine has been killed or is infested, but only 6 percent of the total stand (all species) has been killed.

There was no indication of other than limited expansion of infested area. Almost without exception the trees now containing brood are in the immediate vicinity of trees attacked in 1956.

Samples taken to observe bark beetle brood and attack pattern revealed a great variation between trees. Many trees have been hit hard and contain large healthy aggressive broods but there appeared to be an equal number that were lightly attacked and averaged less brood per gallery. Many "pitch outs" were detected throughout the infested area.

DISCUSSION AND RECOMMENDATIONS

A review of the available reports show the infestation probably started in 1949 and increased in severity in small localized centers until 1952. In 1952 the aggressiveness of the epidemic had decreased and was restricted to areas where loss had previously been heavy. The California Station made a 100 percent cruise of the area in 1953 and found 388 infested trees on 138 acres. The 1956 reconnaissance survey by B. E. Wickman of the California Station states the infestation had increased from 100 acres to 1,000 acres, no estimate of the number of infested trees was given[3/]. Apparently the epidemic increased in severity as well as size from 1953 to 1955. The assumption in the 1956 report by Washburn, Hall and Wickman, that the whole basin was infested has been refuted.

The November 1957 appraisal survey shows that the present epidemic area covers about 1,650 acres and has approximately 2,460 infested trees. According to the survey the infestation did not increase in severity.

A prediction of the probable future trend of this epidemic cannot be made with any reliability. The potential for a sharp rise in numbers of attacked trees is present in the number and concentration of currently infested trees. However, the wide variation that occurs in the pattern of beetle attack from tree to tree is not typical of an aggressive epidemic of mountain pine beetle. Judged by "pitch outs" there were large numbers of unsuccessful attacks. The attack pattern and variation in intensity of attacks appears to be similar to that experienced in 1956 which produced no buildup in the number of attacked trees. Less than half of the timbered area of the basin is infested, with 87 percent of the ponderosa pine within the infested area unaffected. Prevailing winds, according to local people and our observations, move northward across Lake Tahoe into the basin or easterly from the Pacific Coast, indicating less liklihood of rapid spread to the west.

According to the work by Fred Knight and F. M. Yasinski on a similar Dendroctonus attacking ponderosa pine, the percentages of newly attacked trees (1) farther than 1 chain and (2) farther than 5 chains from previously infested trees increases with an increasing buildup ratio. In addition the percentage of currently infested trees farther than 1 chain from previously attacked trees decreases with an increase in the number of "red tops" per acre[4/]. This indicates that in areas

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3/ B. E. Wickman, Forest Insect Conditions, Crystal Bay, Lake Tahoe, Toiyabe National Forest, Reconnaissance Survey, September, 1956.

4/ F. B. Knight, F. M. Yasinski. Incidence of trees infested by the Black Hills Beetle. Research Note 21, Rocky Mountain Forest and Range Experiment Station. May, 1956.

where the attacks per acre are very low it is likely that a large portion of the currently infested trees will be a considerable distance from any "red tops". Conversely, if attacks per acre are high and "red tops" grouped, new attacks are closely associated with these groups. The history of this outbreak indicates that to date this infestation has followed the pattern outlined by Knight. A regression analysis of the variables (buildup ratio and "red top" per acre) of the fall survey indicates that 62.4 percent of the infested trees should be less than 1 chain and 90.4 percent are not more than 5 chains from the "red tops". The survey included a buffer area of about 15 chains beyond the last observed "red top".

While trends are difficult to forecast, it is apparent that a concentration of nearly 2,500 trees on 1,650 acres constitutes a serious threat to the ponderosa pine in the infested area. There also exists the possibility that the rest of the basin and other ponderosa pine stands in the vicinity may become infested. At the rate the outbreak is progressing this would take considerable time. From the entomological standpoint it is not desirable to take the calculated risk that the outbreak will not enlarge. With no assurance that it will die out rapidly, the wise action would be the reduction of the existing high population of mountain pine beetle.

Control of the mountain pine beetle infesting ponderosa pine can be accomplished by logging the infested material and burning the slabs or by treatment of the infested trees with toxicant sprays. Salvage logging to be effective requires the removal of all trees containing bark beetle broods. It usually proves economically unsound for the operator to remove all infested trees, therefore it is generally necessary to treat some infested trees on a salvage logging program. Chemical treatment of the infested trees is effective and usually can be accomplished in less time than salvage logging, but does have the disadvantage of being more expensive and also does not provide for the utilization of the dead and infested material.

In the Crystal Bay situation a combination logging--treating program would probably fit the land use pattern best, as well as being the most economical. Treatment or logging can start any time after the area opens in the spring, but should be completed by the first week in July. Fall treatment and logging to reduce the broods is also effective if the operation is not started until the beetle flight period is completed, probably near the end of August.

Based on past experience it is estimated that treatment of the trees with a water and oil emulsion, containing 3 pounds of ethylene dibromide in 5 gallons, might cost about $15.00 per tree; while spotting and marking for logging would cost about $5.00 per tree. Information on formula, techniques, procedures, and equipment necessary for the treatment of infested trees will be supplied if control should be undertaken.

Table 1.--Analysis of Crystal Bay infestation--comparison of trees killed against residual stand

	Number	SME	Average size	Average no. acre	Percent of stand
Infested trees[1/]		Percent			
New attacks	2,460±524	21	11.6±.09	1.49	
Killed 1956	2,650±474	18	10.6±.08	1.60	
Killed prior to 1956	2,600±1,069	41	(2/)	1.69	
Total	7,710				6.0
Residual stand[3/]					
Ponderosa pine	48,900±6,396	13	12.3±.02	31.75	41.3
Jeffery pine	27,700±5,164	19	13.6±.04	17.99	23.4
Sugar pine	1,300±703	54	(2/)	.84	1.1
White fir	38,200±6,447	17	(2/)	24.81	32.2
Incense cedar	2,400±878	37	(2/)	1.56	2.0
Total green stand	118,500			76.95	100.0
Total original stand	125,510			81.5	

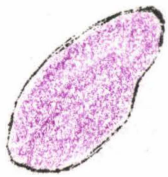
1/ Based on 10 percent survey of infested and red top material
(2/) Data not recorded by diameter
3/ Based on 1 percent loss and green tree survey

Table 2.---Pine stand - Crystal Bay, by diameter classes[1/]

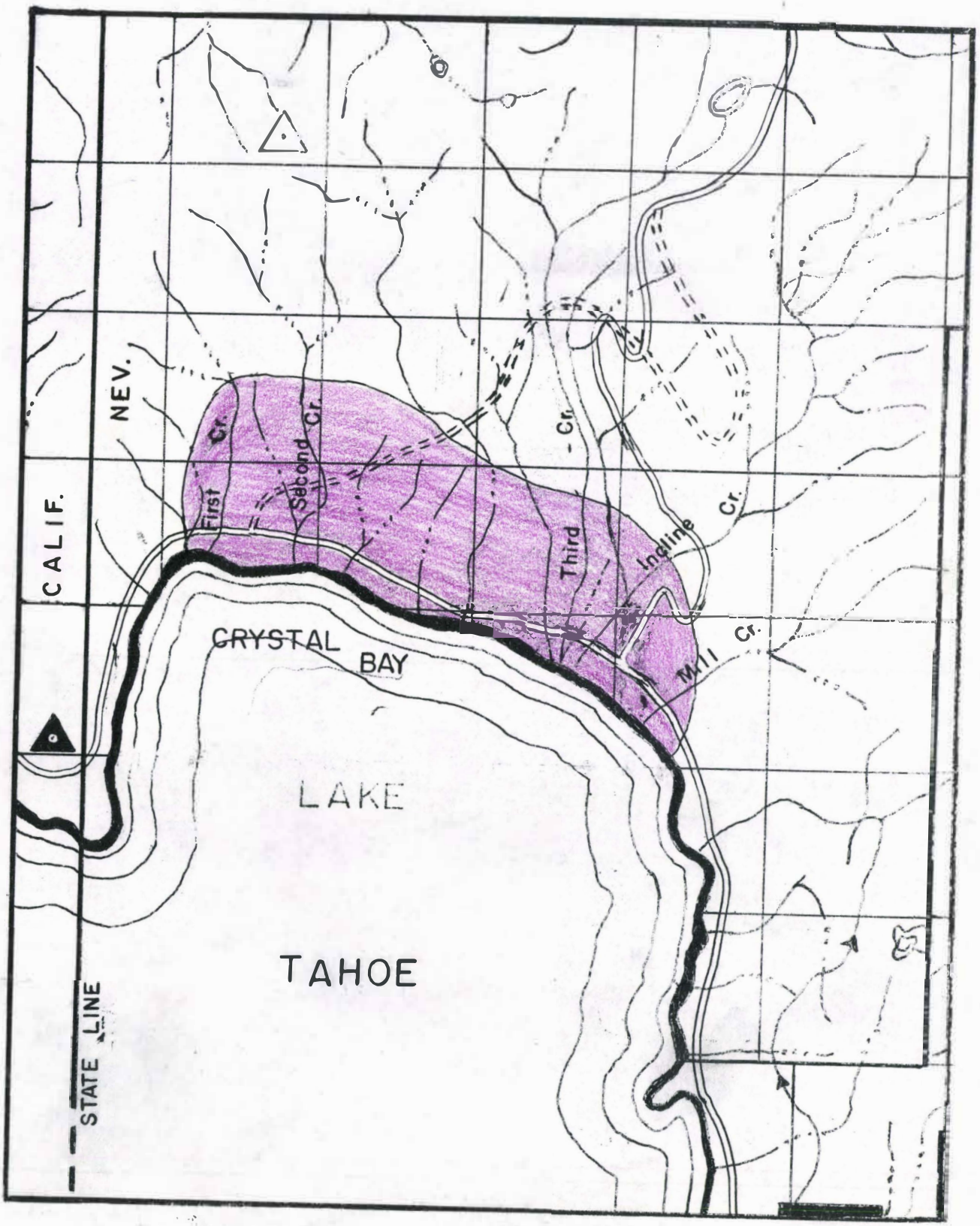
DBH	Trees infested 1957	Trees killed 1956	Buildup[2/] ratio	Trees[3/] killed prior to 1956	Ponderosa Pine		Green Jeffery pine
					Number green	Percent killed 1949-1957	
6"	360	570	0.63:1		4,800		2,000
8"	440	470	.94:1		9,000		4,300
10"	420	510	.82:1		9,200		5,500
12"	440	470	.93:1		8,000		3,700
14"	310	310	1:1		7,800		3,600
16"	170	150	1.1:1		3,000		1,300
18"	170	60	2.8:1		1,900		1,900
20"	50	40	1.25:1		2,300		1,800
22"	40	20	2:1		400		1,000
24"	40	40	1:1		1,200		1,100
26"	20	10	2:1		600		700
28"					400		200
30"					100		300
32"							200
34"							
36"							100
38"							
40 & over					200		
Total	2,460	2,650	.92:1	2,600	48,900	13	27,700

1/ Infested area only based on one percent survey
2/ Infested trees to trees killed 1956
3/ Data not recorded by diameter

Crystal Bay Area
Mountain Pine Beetle Outbreak
1957 Survey



Infestation boundary


NEV.
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First Cr.
Second Cr.
Third Cr.
Incline Cr.
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